

# PATENT ABSTRACTS OF JAPAN

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(30)Priority

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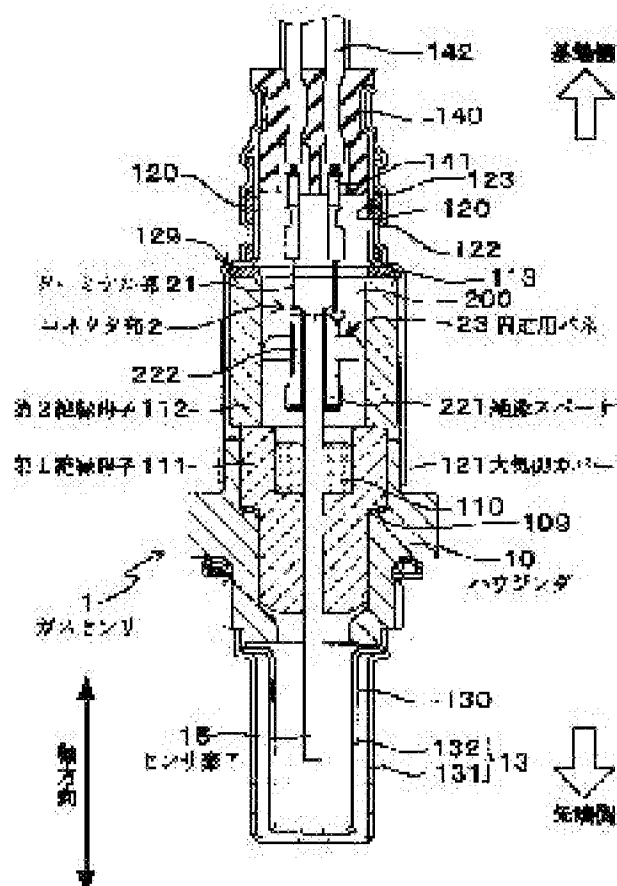
## (54) GAS SENSOR

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a gas sensor whose output drawing-out electrode of a sensor element and a connecting element are attached definitely, which is easy to assemble and which makes a contact failure hardly occur.

**SOLUTION:** This gas sensor 1 has a built-in connecting part 2 which is constructed to connect to an electrode drawing-out part, and the connecting part 2 is made up of terminal parts 21, which has elastic contacting part 210 given the elasticity at least being able to extend to the diameter diagonal to the axis of the gas sensor 1 and which is constructed to be attachable to the electrode drawing-out part at the elastic contact part 210.

(図1)





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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 05/30/2008 / Priority: 1. Industrial Products / 2. Technical term / 3. Electronic engineering

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## FULL CONTENTS

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### [Claim(s)]

[Claim 1] The tubed housing which carries out holding fixing of the 1st insulation insulator which carries out holding fixing of a tabular laminated type sensor element and this tabular sensor element, and this 1st insulation insulator, In the gas sensor which it has, the atmosphere side cover constituted so that it might prepare in the end face side of this housing and the end face side of the above-mentioned sensor element might be covered in the above-mentioned atmosphere side cover So that it may connect electrically to the electrode takeoff connection which prepared the end face side of the above-mentioned sensor element in the end face side of the above-mentioned sensor element while being constituted possible [ holding fixing ] The constituted connector area is built in, the above-mentioned connector area consists of two or more terminal parts, the above-mentioned terminal part has the elastic contact part to which the elasticity which can be expanded and contracted in the radial direction which intersects perpendicularly with a gas sensor axial direction at least was given, and the above-mentioned terminal part is set in the above-mentioned elastic contact part. The gas sensor characterized by being constituted so that the contact to the electrode takeoff connection in the above-mentioned sensor element may be attained.

[Claim 2] The gas sensor characterized by arranging an insulating distance piece in the radial-direction outside in the above-mentioned connector area, and arranging the spring for fixation constituted possible [ elasticity ] at least in the radial-direction outside of this insulating distance piece at the radial direction in Claim 1.

[Claim 3] It is the gas sensor which the above-mentioned insulating distance piece consists of insulating ceramics in Claim 1 or 2, or is characterized by consisting of a resin insulating member.

[Claim 4] It is the gas sensor characterized by the above-mentioned gas sensor element having four or more electrode takeoff connections on a certain side in Claim 1 - any 1 clause of three.

[Claim 5] It is the gas sensor to which the sum total F2 of the elastic power of each elastic contact part which the above-mentioned gas sensor element has two or more electrode takeoff connections in Claim 2 - any 1 clause of four, and was constituted by each electrode takeoff connection possible [ contact ] is characterized by being  $F1 \geq F2$  as compared with the elastic power F1 of the above-mentioned spring for fixation.

[Claim 6] [ the elastic power which the above-mentioned gas sensor element has two or more electrode extraction parts, and each elastic contact part constituted by each electrode takeoff connection possible / contact / has in Claim 1 - any 1 clause of five ] The gas sensor characterized by the ability to correct the

variation in the gap formed between each electrode takeoff connection and each elastic contact part.

[Claim 7] In Claim 2 - any 1 clause of six, [ the above-mentioned insulating distance piece ] Have the inner side side it turned [ side ] to the radial-direction inner side, the tip side which turned to the tip side of a gas sensor, and the outer flank which turned to the radial-direction outside, and [ the above-mentioned terminal part ] The gas sensor characterized by being constituted by the cross-sectional U shape so that the inner side side, a tip side, and an outer flank may be surrounded and maintenance may become possible about the above-mentioned insulating distance piece.

[Claim 8] It is the gas sensor characterized by the above-mentioned terminal part consisting of thin wires of a cross-sectional round shape in Claim 1 - any 1 clause of seven. The section besides the form concerning this claim may serve as a quadrangle.

[Claim 9] The gas sensor which is constituted in Claim 1 - any 1 clause of eight so that holding fixing of the above-mentioned terminal part may be carried out in the inside of the above-mentioned atmosphere side cover and to carry out.

[Claim 10] The tubed housing which carries out holding fixing of the 1st insulation insulator which carries out holding fixing of a tabular laminated type sensor element and this tabular sensor element, and this 1st insulation insulator, In the gas sensor which it has, the atmosphere side cover constituted so that it might prepare in the end face side of this housing and the end face side of the above-mentioned sensor element might be covered in the above-mentioned atmosphere side cover So that it may connect electrically to the electrode takeoff connection which prepared the end face side of the above-mentioned sensor element in the end face side of the above-mentioned sensor element while being constituted possible [ holding fixing ] So that the constituted connector area may be built in, the above-mentioned connector area may consist of two or more terminal parts, the above-mentioned terminal part may have the elasticity which can be expanded and contracted in the radial direction which intersects perpendicularly with a gas sensor axial direction at least and the contact to the electrode takeoff connection in the above-mentioned sensor element may be attained The gas sensor characterized by being constituted.

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the gas sensor used for the combustion control of an internal-combustion engine.

[0002]

[Description of the Prior Art] It attaches to the exhaust air system of an automobile engine, and the gas sensor which had a tabular laminated type sensor element as a gas sensor used for engine combustion control etc. is known. The connector area which secures the various extraction electrodes (portion for energizing to the heater formed in one for the portion and sensor element which take out the output from an element etc.) and electric flow which were prepared in the sensor element, and contacts is prepared in the inside of this gas sensor. The lead drawn out of a gas sensor through this connector area is connected to a sensor element.

[0003]

[Problem(s) to be Solved] By the way, the needs of the compound sensor element are growing in recent years. As what the compound sensor element can detect two or more kinds of gas concentration with one

element, and is used with an automobile engine, a measurable element is simultaneously mentioned, for example in NO<sub>x</sub>, oxygen, an air-fuel ratio, etc. Moreover, in order to raise the accuracy of measurement, the element of complicated composition of having prepared two or more electrochemical cells is also used.

[0004] Since such a sensor element has many cells, it has composition which has many extraction electrodes rather than before. When it is going to attach such a sensor element to a gas sensor with connector structures, such as for example, a JP,8-1493,Y number, a connector area cannot contact the extraction electrode of a sensor element by sufficient thrust, but there is a possibility that the problem from which between both serves as loose connection may arise.

[0005] [ moreover, the oxygen sensor with the connector structure concerning the JP,8-1493,Y number mentioned above ] The metal stowage material which stores an element with an electrode terminal part to the other end of the detection part of an element, It closes whether thrust is generated to the spring member which presses the housing and this housing made from the ceramics which store female contact while insulating electrically the female contact electrically constituted by the electrode terminal part possible [ a flow ] and this female contact from stowage material, and this spring member, and consists of a ring.

[0006] And it extended so that the end of a \*\*\*\*\* ring might be overlapped at the end of metal stowage material, and it constituted so that it might close by this part made to overlap and the end of a ring and the end of stowage material might be fixed.

[0007] In order that this structure may make 1 spring member generate thrust, it closes or separately and a ring is required for it. 2) It is the composition which is complicated, attaches and is hard to carry out.

[0008] Moreover, although the gas sensor concerning the JP,S61-70763,U number is inserting the element which has an electrode takeoff connection four blade springs by which insertion adherence is carried out into an insulating insulator and this insulating insulator, and into it and is considered as the composition which obtains an electric flow The electrode takeoff connection in the field which is this case consists of two places, and it is difficult in space to obtain an electric flow at three or more places.

[0009] This invention was made in view of this conventional problem, between the extraction electrode of a sensor element and connector areas tends to contact certainly, and it is hard to produce, and loose connection is going to attach and offer an easy gas sensor.

[0010]

[Means for Solving the Problem] The tubed housing which carries out holding fixing of the 1st insulation insulator with which invention according to claim 1 carries out holding fixing of a tabular laminated type sensor element and this tabular sensor element, and this 1st insulation insulator, In the gas sensor which it has, the atmosphere side cover constituted so that it might prepare in the end face side of this housing and the end face side of the above-mentioned sensor element might be covered in the above-mentioned atmosphere side cover So that it may connect electrically to the electrode takeoff connection which prepared the end face side of the above-mentioned sensor element in the end face side of the above-mentioned sensor element while being constituted possible [ holding fixing ] The constituted connector area is built in, the above-mentioned connector area consists of two or more terminal parts, the above-mentioned terminal part has the elastic contact part to which the elasticity which can be expanded and contracted in the radial direction which intersects perpendicularly with a gas sensor axial direction at least was given, and the above-mentioned terminal part is set in the above-mentioned elastic contact part. It is in the gas sensor characterized by being constituted so that the

contact to the electrode takeoff connection in the above-mentioned sensor element may be attained.

[0011] What should be most observed in this invention is constituted so that the contact to the electrode takeoff connection in the above-mentioned sensor element of two or more terminal parts which constitute a connector area may be attained in an elastic contact part.

[0012] Next, it explains per operation of this invention. In the gas sensor concerning this invention, a connector area consists of terminal parts of form as shown in drawing 2 mentioned later, for example, and this terminal part has the elastic contact part to which the elasticity expanded and contracted in a radial direction as shown in this figure was given. It is the direction where the direction of the main axis in a gas sensor (axial direction indicated to drawing 1 ) and a radial direction cross at right angles here.

[0013] As shown in drawing 4 and drawing 5 , the above-mentioned terminal part can be surrounded round and can be arranged to a sensor element, and the connector area concerning this invention can constitute it so that the electrode takeoff connection prepared in this sensor element may be made to contact.

[0014] In this case, since an elastic contact part had the elastic power of a radial direction, for example, even when three or more electrode takeoff connections were prepared in one field with a sensor element, it contacted in (refer to drawing 3 ) and other two, but it cannot contact about one certain electrode takeoff connection, but is hard to produce the problem that loose connection will arise. Since the height of a female connector varies, especially the thing for which a flow positive about three or more electrode takeoff connections is secured is difficult for the oxygen sensor with the connector structure concerning the JP,8-1493,Y number which composition mentioned above conventionally.

[0015] Moreover, since the connector area concerning this invention can constitute a terminal part from making it arrange suitably so that a sensor element may be surrounded, it can be realized, without combining various kinds of members intricately. Furthermore, since an elastic contact part expands and contracts between a dashed line and a solid line as shown in drawing 2 when attaching a sensor element to a connector area, it attaches and is easy.

[0016] As mentioned above, according to this invention, between the extraction electrode of a sensor element and connector areas can contact certainly, and it is hard to produce, and loose connection can attach and can offer an easy gas sensor. The above-mentioned terminal part can consist of metal wire material. Moreover, even when the elasticity expanded and contracted in the direction which does not intersect perpendicularly with a main axis, i.e., an oblique position, is given, since the ingredient expanded and contracted in a radial direction exists to some extent, the effect concerning this invention can be acquired.

[0017] Next, it is desirable to arrange an insulating distance piece in the radial-direction outside in the above-mentioned connector area, and to arrange the spring for fixation constituted possible [ elasticity ] in the radial-direction outside of this insulating distance piece at the radial direction like invention according to claim 2. Thereby, element breakage can be prevented to shocks, such as vibration.

[0018] Next, like invention according to claim 3, the above-mentioned insulating distance piece consists of insulating ceramics, or consisting of a resin insulating member is desirable. By constituting an insulating distance piece from insulating ceramics, good insulation is acquired and the spring for fixation can be certainly transmitted to a connector area. Moreover, it can manufacture easily by constituting from a resin insulating member. In addition, alumina ceramics etc. can be used as insulating ceramics. A fluoro-resin, polyamide IMIDO resin, etc. can be used as a resin insulating member.

[0019] Next, like invention according to claim 4, since (referring to [ which is mentioned later ] drawing 3 ) and electric flow reservation become easy when four or more electrode takeoff connections are prepared in a certain side, the above-mentioned gas sensor element is desirable.

[0020] Next, as for the above-mentioned gas sensor element, it is desirable like invention according to claim 5 that the sum total  $F2$  of the elastic power of each elastic contact part which has two or more electrode takeoff connections, and was constituted by each electrode takeoff connection possible [ contact ] is  $F1 \geq F2$  as compared with the elastic power  $F1$  of the above-mentioned spring for fixation. Thereby, electric contact is certainly securable between an electrode takeoff connection and an elastic contact part. When it is  $F1 < F2$ , there is a possibility that it may become impossible to secure the electric contact with an electrode takeoff connection and an elastic contact part.

[0021] Next, as for the elastic power which the above-mentioned gas sensor element has two or more electrode extraction parts, and each elastic contact part constituted by each electrode takeoff connection possible [ contact ] has like invention according to claim 6, it is desirable for the variation in the gap formed between each electrode takeoff connection and each elastic contact part to be corrected. Thereby, electric contact is certainly securable between an electrode takeoff connection and an elastic contact part. In addition, it is constituting as a concrete method of making variation correctable, for example so that the amount of bending until it sticks from the free state of an elastic contact part may become larger than the width of the gap formed between each electrode takeoff connection and each elastic contact part including variation.

[0022] Next, like invention according to claim 7 [ the above-mentioned insulating distance piece ] It has the inner side side it turned [ side ] to the radial-direction inner side, the tip side which turned to the tip side of a gas sensor, and the outer flank which turned to the radial-direction outside, and, as for the above-mentioned terminal part, it is desirable to be constituted by the cross-sectional U shape so that the inner side side, a tip side, and an outer flank may be surrounded and maintenance may become possible about the above-mentioned insulating distance piece. An insulating distance piece can be certainly held by a terminal part by this, and the position shift of an insulating distance piece, omission, etc. can be prevented. Moreover, this can be fixed to a predetermined position, without giving special processing to an insulating distance piece.

[0023] Next, as for invention according to claim 8, it is desirable that the above-mentioned terminal part consists of thin wires of a cross-sectional round shape. Thereby, it can be more rich in elasticity and the gas sensor through which it can be flowed electric can be easily obtained with a gas sensor element.

[0024] Next, as for invention according to claim 9, it is desirable to be constituted so that holding fixing of the above-mentioned terminal part may be carried out in the inside of the above-mentioned atmosphere side cover. Thereby, permeation of the impurities in the atmosphere which checks an electric flow, water, etc. can be prevented.

[0025] Next, the tubed housing which carries out holding fixing of the 1st insulation insulator with which invention according to claim 10 carries out holding fixing of a tabular laminated type sensor element and this tabular sensor element, and this 1st insulation insulator, In the gas sensor which it has, the atmosphere side cover constituted so that it might prepare in the end face side of this housing and the end face side of the above-mentioned sensor element might be covered in the above-mentioned atmosphere side cover So that it may connect electrically to the electrode takeoff connection which prepared the end face side of the above-mentioned sensor element in the end face side of the above-mentioned sensor element while being constituted possible [ holding fixing ] So that the constituted

connector area may be built in, the above-mentioned connector area may consist of two or more terminal parts, the above-mentioned terminal part may have the elasticity which can be expanded and contracted in the radial direction which intersects perpendicularly with a gas sensor axial direction at least and the contact to the electrode takeoff connection in the above-mentioned sensor element may be attained. It is in the gas sensor characterized by being constituted.

[0026] In the gas sensor concerning this invention, since a connector area has the elastic power of a radial direction, it is hard to produce loose connection between an electrode takeoff connection and a connector area. Moreover, since the connector area concerning this invention can constitute a terminal part from making it arrange suitably so that a sensor element may be surrounded, it can be realized, without combining various kinds of members intricately. Furthermore, since the whole connector expands and contracts when attaching a sensor element to a connector area, it attaches and is easy.

[0027] As mentioned above, according to this invention, between the extraction electrode of a sensor element and connector areas can contact certainly, and it is hard to produce, and loose connection can attach and can offer an easy gas sensor. In addition, it is the same as that of \*\*\*\*\* for details.

[0028] In addition, the method of constituting a connector area from material which was softly excellent in elasticity as a way a connector area has elasticity is mentioned. For example, with constituting a connector area from pure nickel and a nickel alloy, while the connector area itself has elasticity, the connector area through which it can be flowed electric can be obtained.

[0029]

[Mode for carrying out the invention] It explains using drawing 1 - drawing 7 about the gas sensor concerning the example of an embodiment of example of embodiment 1 this invention. The tubed housing 10 which carries out holding fixing of the 1st insulation insulator 111 with which the gas sensor 1 of this example carries out holding fixing of the tabular laminated type sensor element 15 and this tabular sensor element 15, and this 1st insulation insulator 111 as shown in drawing 1, It prepares in the end face side of this housing 10, and has the 2nd insulation insulator 112 arranged inside the atmosphere side cover 121 constituted so that the end face side of the above-mentioned sensor element 15 might be covered, and this atmosphere side cover 121.

[0030] The connector area 2 constituted so that it might connect to the electrode takeoff connection 151 of one planes [ four ] which prepared the end face side of the above-mentioned sensor element 15 in the end face side of the above-mentioned sensor element 15 as shown in drawing 3 while being constituted possible [ holding fixing ] is built in the above-mentioned 2nd insulation insulator 112.

[0031] As the above-mentioned connector area 2 is shown in drawing 4 and drawing 5, it consists of eight terminal parts 21, and each terminal part 21 has the elastic contact part 210 to which the elasticity which can be expanded and contracted in the radial direction which intersects perpendicularly with the axial direction of a gas sensor 1 was given, as shown in drawing 2. And as shown in drawing 6, the above-mentioned terminal part 21 is constituted so that the contact to the electrode takeoff connection 151 in the above-mentioned sensor element 15 may be attained in the above-mentioned elastic contact part 210.

[0032] It explains in detail hereafter. As shown in drawing 1, the double under-test gas side cover 13 with which the gas sensor 1 of this example is on the tip side of housing 10 from the inner side cover 132 and the outside cover 131 is formed. The atmosphere side cover 121 is formed in the end face side of housing 10.



[0033] Inside housing 10, the 1st insulating insulator 111 which carried out closure fixation of the sensor element 15 by the glass material 110 is arranged through the metallic packing 109. It is the upper end face part side of the 1st insulating insulator 111, and the 2nd insulating insulator 112 is arranged inside the atmosphere side cover 121. The end face side of the atmosphere side cover 121 is constituted by \*\*\*\*, and the plate spring 113 is arranged between the 2nd insulation insulator 112 and the atmosphere side cover 121 in the shoulder 129 which changes to path fine large-diameters.

[0034] The outside cover 122 is arranged through the water-repellent filter 123 in the lateral surface by the side of the end face of the atmosphere side cover 121. Moreover, the air introduction hole 120 is formed in the field which met the water-repellent filter 123 in the atmosphere side cover 121 and the outside cover 122.

[0035] Inside the atmosphere side cover 121 of the part where the outside cover 122 has been arranged, the insulation material 140 made of rubber is arranged. It is constituted so that the lead 142 used when taking out the output of the sensor element 15 outside inside this insulation material 140 or supplying electric power to the sensor element 15 from the exterior may be inserted in.

[0036] In the inside of the above-mentioned 2nd insulation insulator 112, the interior space part 200 is formed and the connector area 2 is installed here. The terminal part 21 which forms the connector area 2 is form at the time which metal wires of a cross-sectional round shape are consisted of, and is shown in drawing 2 (a). That is, it becomes a terminal area 23 and the main part part 219 from a part 22 by return, and there is an elastic contact part 210 in the center of the main part part 219. As such a terminal part 21 shows drawing 5, it arranges in the interior space part 200 of the 2nd insulation insulator 112, and the connector area 2 is constituted.

[0037] The terminal part 21 is a portion connected to the lead 142 by the splicing fittings 141. The main part part 219 has the form which bent to the radial direction in the central part as a whole, and it is constituted so that this portion can change between the solid line and dashed line which are shown in drawing 2. The portion of bending is the elastic contact part 210. Moreover, the part 22 is formed by return for omission prevention of the terminal part 21 to the 2nd insulation insulator 112.

[0038] Moreover, as shown in drawing 5 and drawing 6, two insulating distance pieces 221,222 are arranged on the radial-direction outside in the connector area 2. Moreover, as shown in drawing 7, the above-mentioned insulating distance piece 221,222 has the inner side side 225 it turned [ side ] to the radial-direction inner side in a gas sensor 1, the tip side 226 which turned to the tip side of a gas sensor 1, and the outer flank 227 which turned to the radial-direction outside. The above-mentioned terminal part 21 is constituted by the cross-sectional U shape so that the inner side side 225, the tip side 226, and the outer flank 227 may be surrounded and maintenance may become possible about the above-mentioned insulating distance piece 221,222.

[0039] And as shown in drawing 6, the spring 23 for fixation which the insulating distance piece 221,222 constituted possible [ elasticity in a radial direction ] in the radial-direction outside further is arranged. This insulating spacer 221,222 is arranged in the both-sides side (this side is a field in which the extraction electrode 151 is formed.) of the sensor element 15, and as the field which meets the sensor element 15 is shown in drawing 6 (a), the crevice 220 for carrying out position fixation of each terminal part 21 is formed.

[0040] Moreover, as shown in drawing 6 (a), the branch 232 and the hit part 233 which were constituted so that this internal surface might be energized are prepared, projecting the spring 23 for fixation on the

radial-direction outside, and contacting the internal surface of the interior space part 200 from the attaching part 231 and this attaching part 231 holding the insulating spacer 221,222.

[0041] As shown in drawing 6 (b), since a plane is determined by three points, as shown in this figure, in the example of the book which has arranged four terminal parts 21 in one side, the terminal part 21 which cannot contact to the gas sensor element 15 may generate it. As had elasticity in terminal part 21 itself, it constitutes from forming the spring 23 for fixation constituted from this example possible [ elasticity ] in the radial direction, and loose connection is prevented at the time [ according to / variations, such as a path of the terminal part 21, ] shown in this figure.

[0042] In addition, it is desirable that the elastic power F1 over the gas sensor element 15 of the above-mentioned spring 23 for fixation constitutes so that it may become more than sum total F2 of the elastic power of the elastic contact part 210 of four terminal parts 21, and this example is also constituted such.

[0043] The operation effect of this example is explained. Consisting of eight terminal parts 21 the connector area 2 indicates the gas sensors 1 of this example to be to drawing 2, this terminal part 21 has the elastic contact part 210 to which the elasticity expanded and contracted in a radial direction as shown in this figure was given. As eight terminal parts 21 are shown in drawing 4 and drawing 5, the connector area 2 is surrounded round, is arranged to the sensor element 15, and it is constituted so that the electrode takeoff connection 151 prepared in this sensor element 15 may be made to contact.

[0044] Since it has the elastic power of a radial direction, though the form of each elastic contact part 210 varies a little, trouble does not produce the elastic contact part 210 easily in contact for the sensor element 15. It is for the elastic contact part 210 transformed with elasticity to absorb the variation in form. Moreover, even case [ whose electrode takeoff connection 151 is / like this example prepared in four sides of the sensor element 15 ], it is hard to produce loose connection.

[0045] moreover -- the connector area 2 concerning this example can be constituted from arranging the terminal part 21 suitably so that the sensor element 15 may be surrounded -- structure -- it is simple. Furthermore, since the elastic contact part 210 expands and contracts between a dashed line and a solid line as shown in drawing 2 when attaching the sensor element 15 to the connector area 2, it attaches and is easy.

[0046] As mentioned above, according to this example, between the extraction electrode of a sensor element and connector areas can contact certainly, and it is hard to produce, and loose connection can attach and can offer an easy gas sensor.

[0047] Moreover, in this example, since the insulating distance piece 221,222 is arranged on the radial-direction outside in the connector area 2, a mutual insulation of the connector area 2, the spring 23 for fixation, and the atmosphere side cover 121 can be taken certainly. Furthermore, by the branch 232 of the spring 23 for fixation, and the hit part 233, since the internal surface of the interior space part 200 is energized in the radial-direction outside of the insulating distance piece 221, on it, sensor element 15 breakage can be prevented to shocks, such as vibration.

[0048] In addition, the gas sensor of this example can use an element tabular lamination type as a sensor element, and elements for measurement, such as an element for air-fuel ratio measurement used with the internal-combustion engine for cars besides the element for oxygen concentration measurement and NOx, and CO, HC, can be used for it as this element.

[0049] In addition, as shown in drawing 2 (b), the terminal part 21 which formed two elastic contact parts 211,212 in the main part part 219 can also be used. This terminal part 21 makes the elastic contact part 212 contact about a thing with the Drawings bottom, and makes the elastic contact part 211 contact

about a thing with the Drawings bottom in four electrode takeoff connections 151 of the gas sensor element 15 shown in drawing 3 . Thereby, electric connection is securable in one kind of terminal part 21 to four electrode takeoff connections 151 of gas sensor element 15 one side.

[0050] Moreover, if the ingredient expanded and contracted in a radial direction exists to some extent even when the elasticity which the elastic contact part 210 of the terminal part 21 expands and contracts in the direction which does not intersect perpendicularly with a main axis, i.e., an oblique position, is given, the effect of this example can be acquired.

[0051] The example of two examples of an embodiment explains the gas sensor which has the same connector area as the example 1 of an embodiment, and a terminal part. The gas sensor 1 of drawing 8 has the connector area 2 which consists of four terminal parts 21 and an insulating distance piece 221 at the time shown in an inside at drawing 9 .

[0052] The gas sensor 1 of drawing 10 has the connector area 2 which consists of four terminal parts 21 and an insulating distance piece 221 at the time shown in an inside at drawing 11 . The gas sensor 1 of drawing 12 has the connector area 2 which turns into an inside from the terminal part 21 and the insulating distance piece 221 at the time shown in this figure. Detailed composition is the same as that of the example 1 of an embodiment almost, and the operation effect of it is the same as that of the example 1 of an embodiment.

#### [Brief Description of the Drawings]

[Drawing 1] The cross-sectional explanatory view of a gas sensor in the example 1 of an embodiment.

[Drawing 2] The explanatory view of (a) terminal part, the explanatory view with two (b) elastic contact parts of a terminal part in the example 1 of an embodiment.

[Drawing 3] The explanatory view of the electrode extraction part in a sensor element in the example 1 of an embodiment.

[Drawing 4] A connector area [ / near the sensor element end face part in the example 1 of an embodiment ], and the eye squinting explanatory view of an insulating distance piece.

[Drawing 5] The explanatory view of terminal part arrangement of a connector area [ / near the sensor element end face part ] in the example 1 of an embodiment.

[Drawing 6] The explanatory view about the relation of the spring for (a) fixation, the explanatory view of an insulating spacer and a terminal part and the spring for (b) fixation, and terminal part in the example 1 of an embodiment.

[Drawing 7] The explanatory view of the insulating spacer in the example 1 of an embodiment, and the terminal part of a cross-sectional U shape.

[Drawing 8] The cross-sectional explanatory view of a gas sensor in the example 2 of an embodiment.

[Drawing 9] The explanatory view of a connector area in the example 2 of an embodiment.

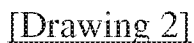
[Drawing 10] The cross-sectional explanatory view of a gas sensor in the example 2 of an embodiment.

[Drawing 11] The explanatory view of a connector area in the example 2 of an embodiment.

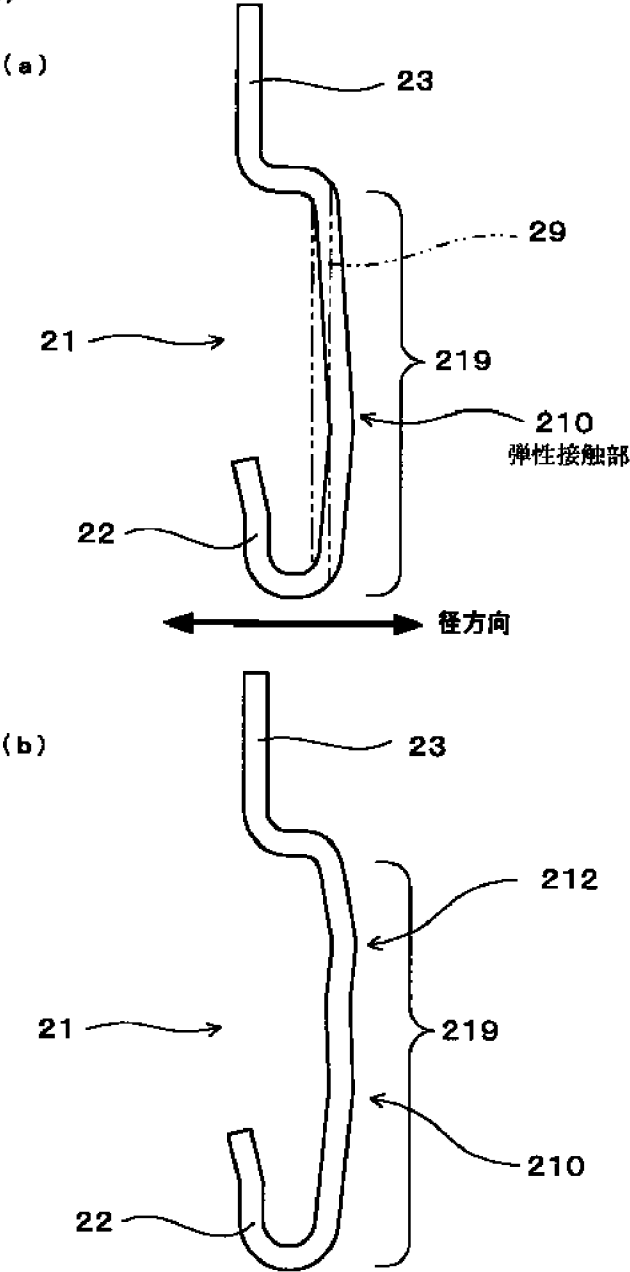
[Drawing 12] The cross-sectional explanatory view of a gas sensor in the example 2 of an embodiment.

[Explanations of letters or numerals]

(圖 1)

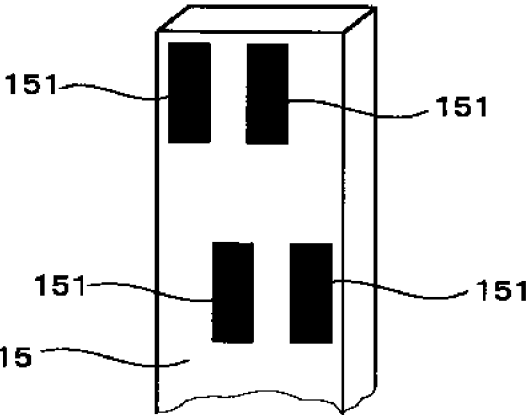


(図 2)



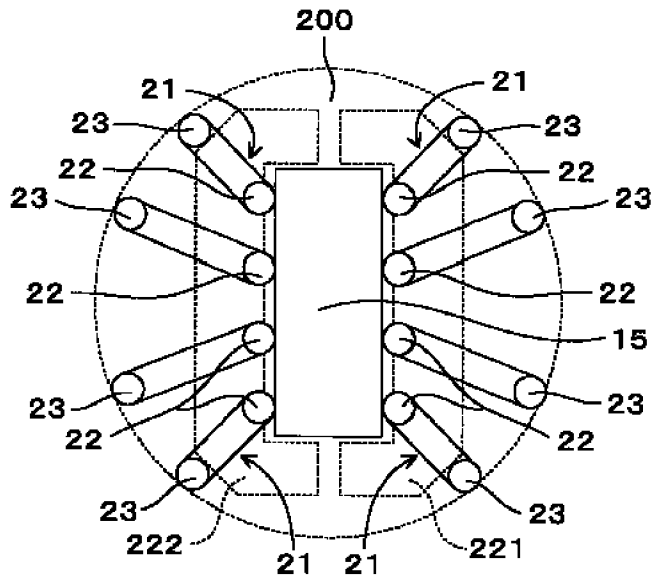
[Drawing 3]

(図 3)



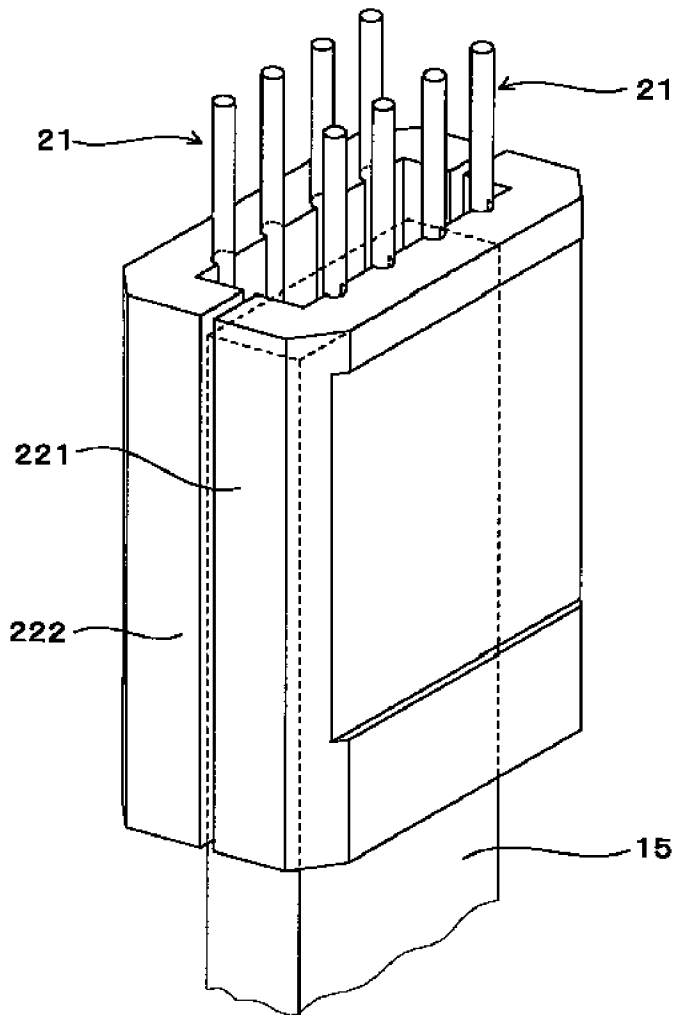
[Drawing 5]

(図 5)



[Drawing 4]

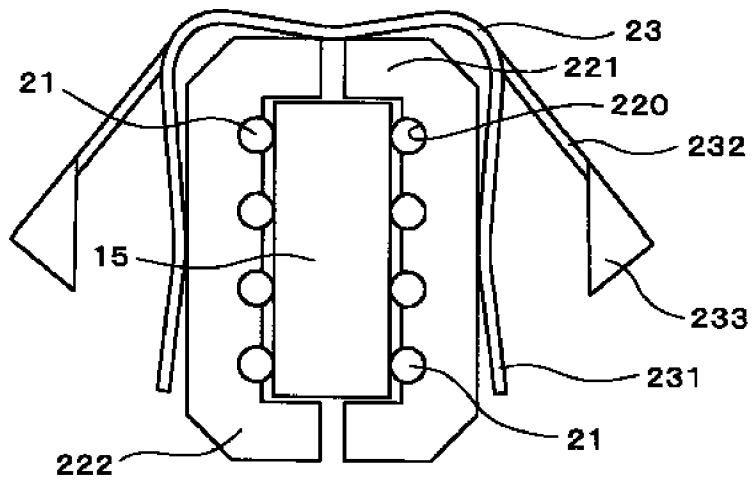
(図 4)



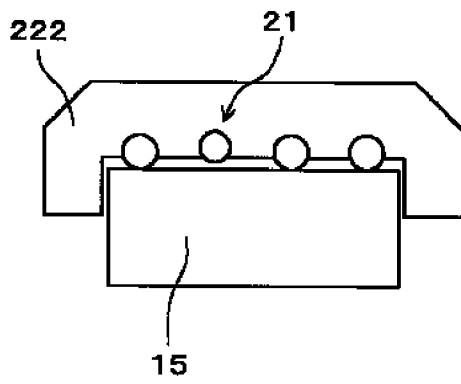
[Drawing 6]

(図6)

(a)

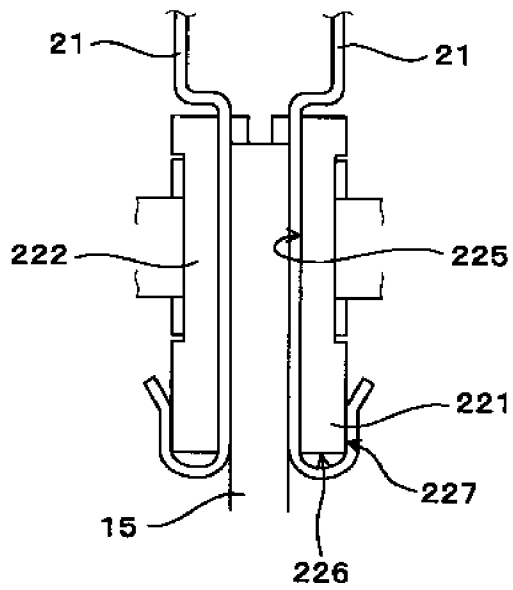


(b)



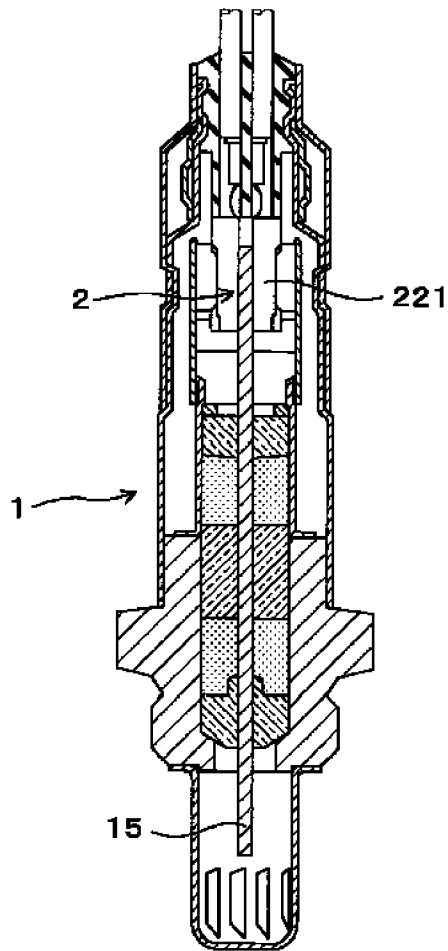
[Drawing 7]

(図 7)



[Drawing 8]

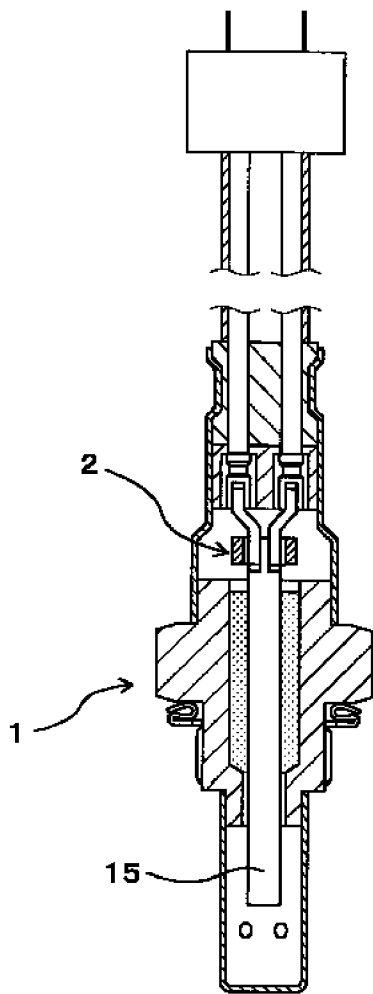
(図 8)



[Drawing 10]

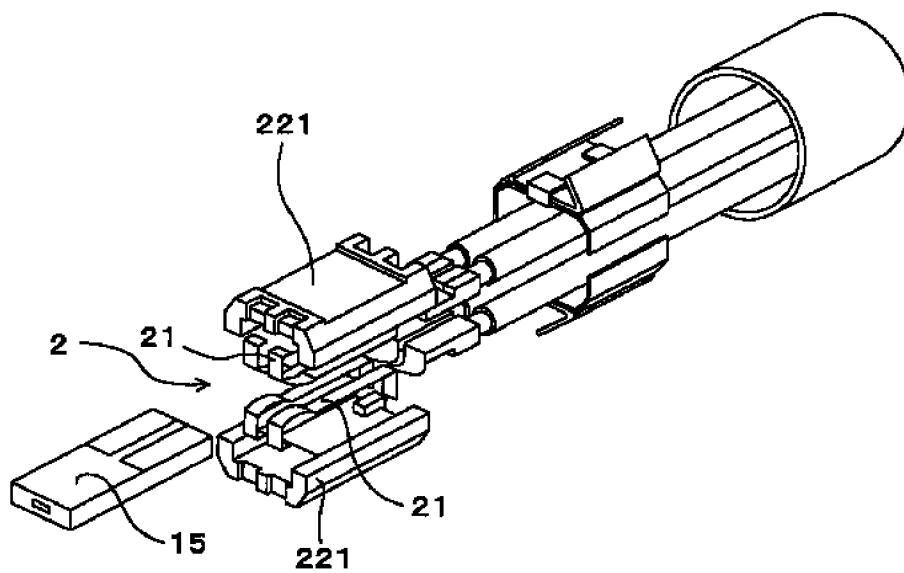


(図 10)




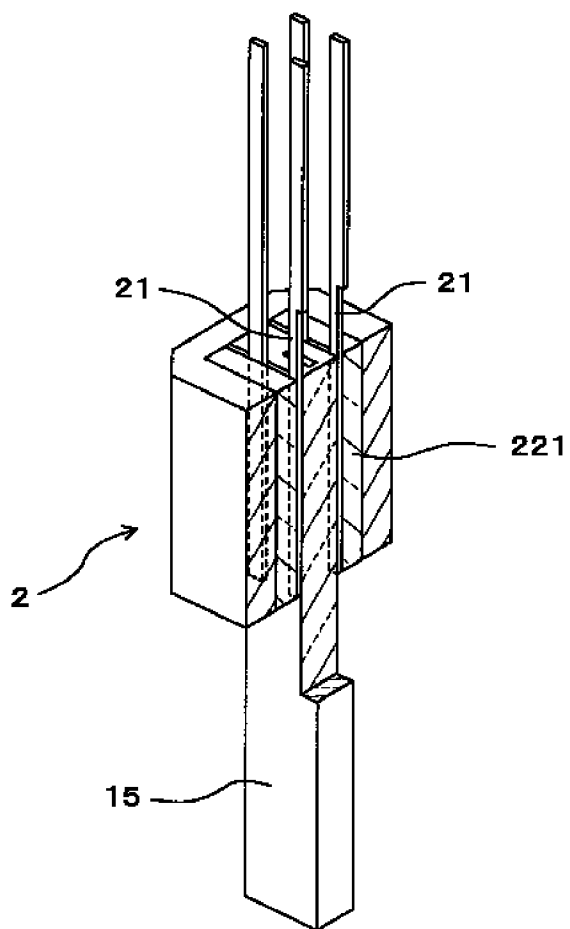
[Drawing 9]

(図 9)



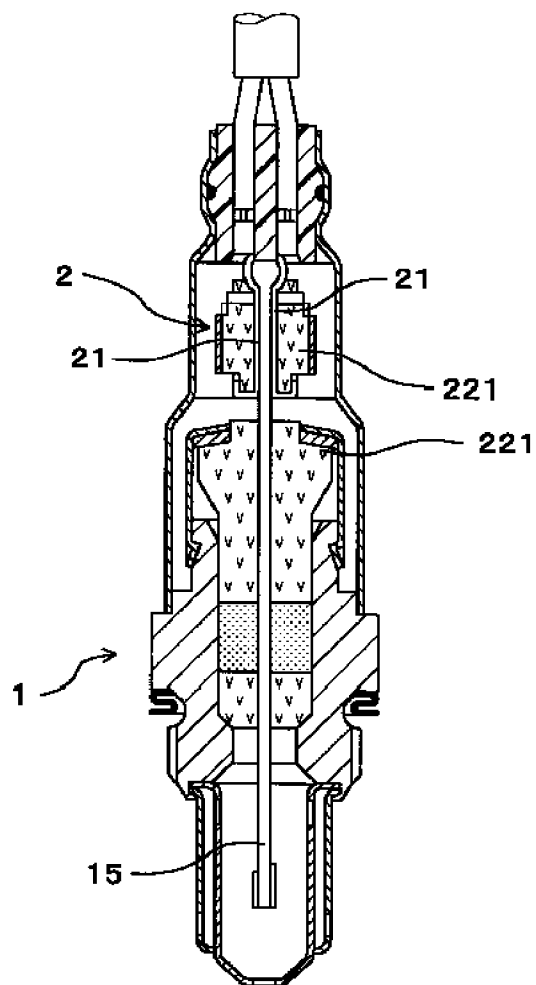
[Drawing 11]

( 1 1)



[Drawing 12]

(図 1 2)



[Translation done.]